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## Systemic failure in macroeconomic modelling

Martin Reynolds

### ABSTRACT

Terms like systemic crisis and systemic failure are used with increasing frequency particularly by journalists, politicians, as well as academics, to account for things going wrong in an increasingly complex and uncertain world. But what does systemic failure actually mean from a systems thinking perspective, and how might more effective thinking reduce incidences of systemic failure? This paper argues that three interwoven traps of modelling contribute as a confluence towards systemic failure - reductionism, dogmatism, and managerialism. Using the example of systemic failure of academic economics in averting the global financial crisis – as expressed by prominent economists themselves - each of the three traps is explored. The confluence of these traps working together are illustrated by the ideas from a tradition of critical systems thinking associated with systemic triangulation, and ideas from the science of political economy associated with the ‘iron triangle’. Some practical tools from systems approaches are suggested to counter traps of systemic failure using a suggested heuristic of systems thinking in practice.

**Keywords:** Critical systems thinking, dogmatism, iron triangle, managerialism, reductionism, systemic failure, systemic triangulation, systems thinking in practice.

## 1. Systemic failure: an otherworldly event?

The problem of modelling and systemic failure is expressed in an opinion paper authored by eight economists who gathered with other economists for a week of intense discussions in the wake of the 2007/8 global financial crises at the Kiel Institute for the World Economy in Germany in 2008 (Colander et. al., 2009). The paper describes the systemic failure of academic economists to model appropriately in order to avert or warn against the impending events:

“The global financial crisis has revealed the need to rethink fundamentally how financial systems are regulated. It has also made clear a *systemic failure of the economics profession*. Over the past three decades, economists have largely developed and come to rely on models that disregard key factors—including heterogeneity of decision rules, revisions of forecasting strategies, and changes in the social context—that drive outcomes in asset and other markets. It is obvious, even to the casual observer that these models fail to account for the actual evolution of the real-world economy. Moreover, the current academic agenda has largely crowded out research on the inherent causes of financial crises. There has also been little exploration of early indicators of system crisis and potential ways to prevent this malady from developing. In fact, if one browses through the academic macroeconomics and finance literature, “systemic crisis” appears like an otherworldly event that is absent from economic models. Most models, by design, offer no immediate handle on how to think about or deal with this recurring phenomenon. [...] That, to us, is a *systemic failure of the economics profession*.” (ibid p.2 original italics)

The description of systemic failure here resonates with a familiar wider notion of a collapse in the way things are supposed to link up or interrelate. In a world where we increasingly appreciate that everything connects, failure is commonly regarded in terms of disabled connections. The antidote to systemic failure is often regarded in terms of more ‘joined up thinking’ or ‘seeing the forest through the trees’. So the Kiel authors identify the failure of economic models in not taking account of the intricate relationships of entities in the ‘real-world economy’. Prevailing models, they suggest, actually marginalise or disregard key factors in the real-world such as the different levels of decision making, forecasting strategies, and changes in social context.

In their paper, the Kiel authors document an accumulation of restrictive economic modelling practices. They also significantly note a failure amongst economists to responsibly convey the limitations of economic modelling to those using the models and those in wider society affected by the use of such models. So avoiding systemic failure is in-part about ‘getting the big picture’. But failure might be rooted in at least two other interlocking respects. One is the need for surfacing and appreciating different perspectives. The claim that the “academic agenda has largely crowded out research” suggests a familiar academic sense of being closed-minded and insular with regards to ideas and perspectives from other disciplines or indeed unconventional perspectives arising within a discipline.

Both ideas – capturing inter-relationships and engaging with different perspectives - can be associated with a more concise understanding of Systems. What is it about a system that can make systemic failure less otherworldly? A definition of a system developed by Open University systems academics and referred to by Morris (2009, p.16) suggests that a system is simply:

- a collection of entities ...
- that are seen by someone ...
- as interacting together ...
- to do something.

Using this definition shifts attention away from simply regarding systems as objective real world entities as commonly assumed in phrases like ‘the’ economic system or ‘the’ education system, towards systems

as individual and/or collective constructs imbued with some sense of purpose. Sometimes the distinction is made more explicit by referring to a 'system of interest' as against a 'system'. So a system comprises of some interrelationships among entities (i.e. 'entities... interacting together') seen from a particular perspective ('seen by someone...to do something').

A third related aspect of systemic failure hinted at through the underlined words in the preceding sentence lies with the provisional nature of the *models* that we as humans use to make sense of inter-relationships and to engage with different perspectives. For the purposes of this paper the term 'system' will be used synonymously with 'model' – a conceptualisation or 'system of interest' relating to some real world entity, but ontologically different from the real world entity (cf. Checkland and Howell, 2004). Modelling is a human activity, and as such subject to imperfections – human errors in not selecting the most appropriate variables over time and changing circumstances, and human bias in valuing or preferring particular models over others. Not being critically reflective of our models can be a significant factor in generating systemic failure more generally.

The aim of this paper is to explore the usefulness of some systems ideas for grappling generically with issues of systemic failure, but using the concerns expressed by the Kiel authors on macroeconomic modelling by way of illustration. The next section explores ideas expressed in the Kiel paper in terms of a confluence of three traps of modelling – reductionism, dogmatism, and managerialism - reflecting the three generic contributions to systemic failure described above. The section following then introduces the idea of systemic triangulation – a methodological core idea in systems thinking developed by the systems philosopher and social planner, Werner Ulrich. The section also explores the usefulness alongside systemic triangulation of the 'Iron Triangle' metaphor drawn principally from Political sciences, as a way of making sense of, and framing, the workings and confluence between the three traps of modelling. The final section introduces a systems thinking in practice heuristic – incorporating ideas of systemic triangulation - as a means of guiding practice to avoid systemic failure.

## **2 Systemic failure: three traps of modelling**

A common feature of systems – whether used for exploring inter-relationships or used more for negotiating among multiple perspectives – is their essential bounded nature. All our thinking is bounded in some way. In strategic management this idea comes across strongly through the important principle of 'bounded rationality' (Simon, 1991). What makes systems thinking distinctive is the explicit manner in which boundaries are surfaced. Our mental constructs – the ways in which we think – are bounded as epistemological constructs. In a sense we are trapped by our thinking. Where systems are regarded as essentially *conceptual* constructs to make sense of reality, rather than actual real world entities, what is important is not just the potential usefulness of different constructs to improve situations but also the awareness and surfacing of such bounded constructs as potential traps that inhibit a more critical and systemic dimension of systems thinking.

Drawing on an analysis of the critical dimension of systems thinking (Reynolds, 2011a), there appear to be three essential traps associated with systems modelling that can lead to systemic failure: (i) the trap of *reductionism* in not dealing appropriately with interrelationships; (ii) the trap of *dogmatism* in not dealing appropriately with contrasting perspectives; and (iii) the trap of *managerialism* in naively assuming comprehensive and impartial use of management tools or models. An example of this last trap is in fetishising management models as being completely ‘holistic’ (in dealing with *all* interrelationships) and/or completely ‘pluralistic’ (in dealing with *all* viewpoints with *equal weight* of concern). Each trap is described briefly below in the context of the Kiel opinion paper.

## 2.1 Capturing contexts of change: avoiding reductionism (Trap 1)

"Only Connect ..... " E. M. Forster (*Howards Way*)

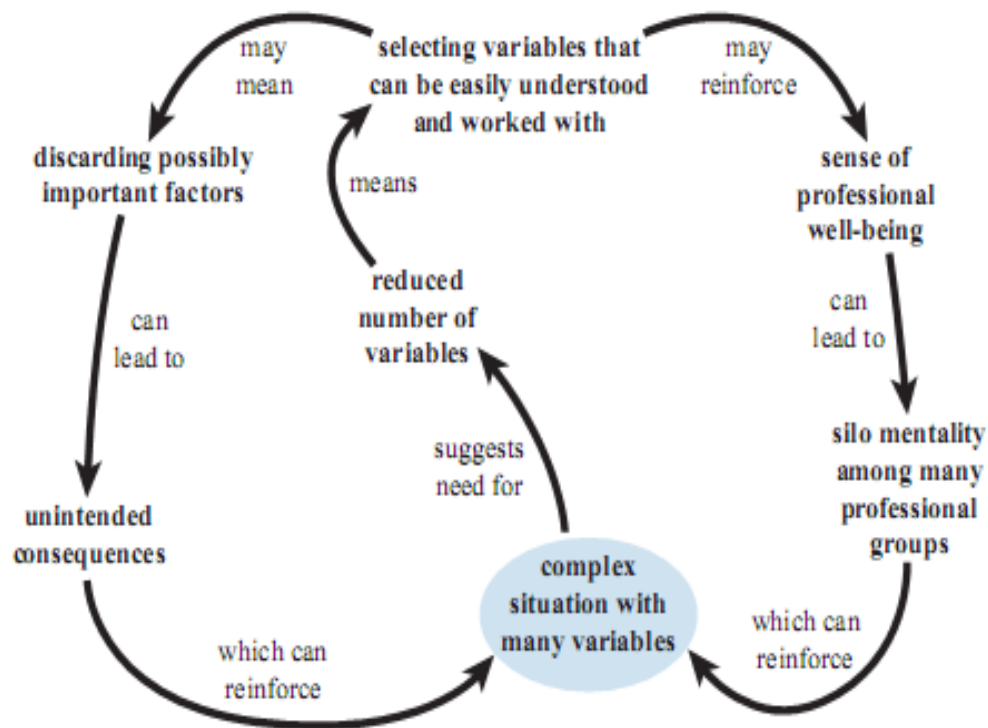
Any modelling of reality is, by its very nature, reductionist. Models can only capture parts of any contexts of change. The task for appropriate systems modelling is to capture those parts of reality which are significant for the purpose of understanding reality. Reductionism occurs when the reductionist endeavour, say economic modelling, fails to capture significant influences and entities, or captures them in an inappropriate way, say, for example, translating immeasurable qualitative entities like emotion or environmental values, into monetary variables.

The Kiel authors focus most of their critique on economic modelling based on what they call a prevailing ‘conceptual reductionist paradigm’. This is expressed in the “representative agent approach in economics ...[which] views the entire economy as an organism governed by a universal will...[It] blocks from the outset any understanding of the *interplay between micro and macro levels*” (Colander et. al., p.8).

Prevailing economic models, the paper suggests, tend to exclude *factors* that generate crises. For example, the authors claim that ‘systemic risk factors’ including different externalities and individual behaviours are simply not accounted for: “if one browses through the academic macroeconomics and finance literature, “systemic crisis” appears like an otherworldly event that is absent from economic models.” (ibid p.1).

Likewise, prevailing models exclude particular *actors* such as non-rational stakeholders, and other networked stakeholders, that typically generate crises. Models omit important extra-disciplinary ideas including Network theory and ‘self-organised criticality theory’ amongst others. In short financial modellers appear to generate an intra-disciplinary ‘silo’ mentality. Moreover, prevailing models exclude longer term temporal changes of boom and bust focusing rather on shorter term periods characterised by economic stability.

To use a well-worn though significant adage amongst systems practitioners, a system is merely a *map* of a situation or territory, not to be confused with the actual *territory*. Arguably the prime purpose of systems thinking is to make simple the complex – that is, to bound the unbounded ontological complex realities variously referred to as ‘messes’ (Russell Ackoff), ‘the swamp’ (Donald Schön), or ‘wicked problems’ (Horst Rittel). To use the language of communications engineering, systems as conceptual constructs provide purposeful ways for generating meaningful ‘signals’ or patterns of abstracted data sets from the cacophonous ‘noise’ of reality (cf. Richardson, 2010 p. 2). Whereas complexity science has made valuable and intriguing strides in capturing real world complexity, particularly through computational modelling, systems thinking prompts a more cautionary note against a comprehensive understanding of reality (see Fig.1).



**Figure 1 Influence diagram illustrating reductionism in conventional thinking**

Figure 1 illustrates some pitfalls with systems modelling in reducing the complexity of situations to make them manageable. Whilst modelling realities inevitably reduces the complexity of a situation, it can reinforce systemic failure through (i) generating further unforeseen effects on factors in the environment outside the purview of the model, as well as (ii) generating silo mentalities amongst practitioners (including, of course, professional economists) whose blinkeredness is not helpful in providing more purposeful support. The result of these two paths is an increase in complexity and uncertainty.

The Kiel paper suggests something about there being a collapse in the way things are supposed to link up or interrelate. In a world where we increasingly appreciate that everything connects, the antidote to systemic failure is holistic thinking – getting the bigger picture. So having a wider holistic viewpoint involves looking beyond, say, the ‘rational representative agent’, and embracing more the interplay

between micro and macro levels of economic activity. Systems thinking is here characterised in terms of modelling wholes rather than parts. But crucially, wholes or systems are not pre-given.

## 2.2 Engaging with multiple perspectives: avoiding dogmatism (Trap 2)

*"A systems approach begins when first you see the world through the eyes of another"*  
(Churchman, 1968 p.231)

Systemic failure can often be attributed to the sidelining of relevant perspectives. Dogmatism is here understood as an adherence to one particular perspective or set of perspectives.

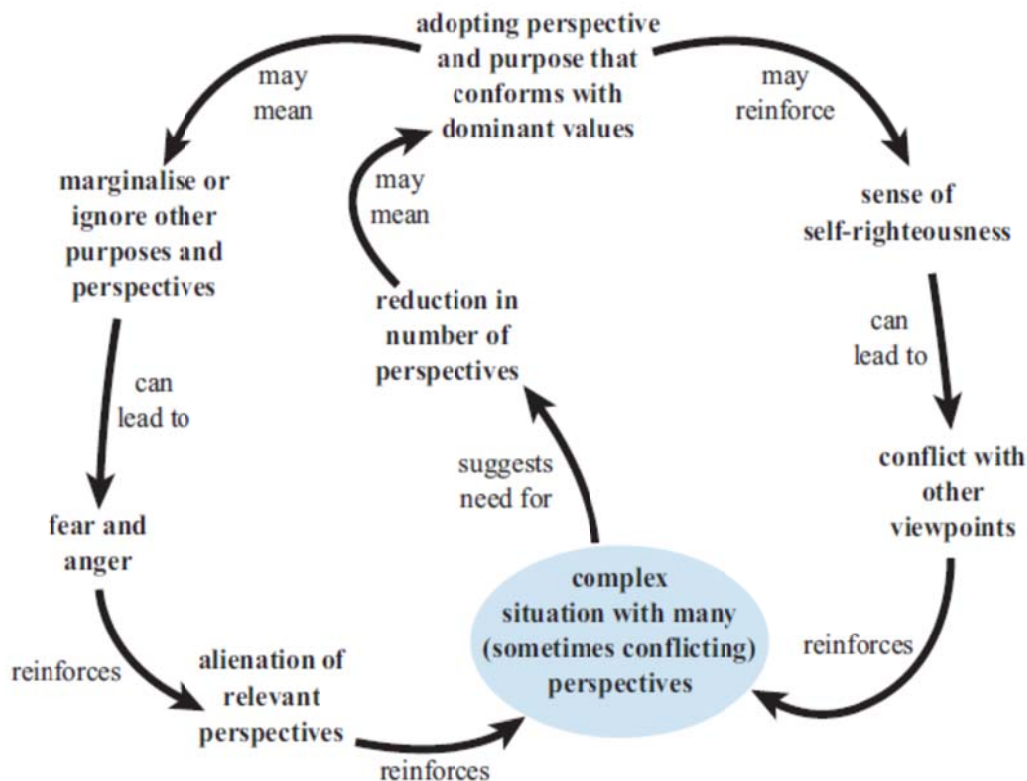
There are different perspectives associated with modelling the economy. From a banker's perspective economic modelling might be described as a system for enabling efficient use of monetary resources to promote profit and growth. But from, say, an environmental activist's perspective, economic modelling may be described as a system for challenging (or justifying) the depletion of natural resources.

The Kiel authors make clear that contemporary financial models are focused solely on the rather narrow perception that economics is concerned only with the allocation of scarce resources. The ideas used at the micro level of financial modelling are based upon the unquestioned appropriateness of the 'dynamic general equilibrium model'. Models are built on unspoken assumptions; for instance: "asset-pricing and risk management tools are developed from an individualistic perspective...taken as given the behaviour of all other market participants" (Colander et.al., 2009 p.5). This is not to suggest that all economists have worked on these assumptions or that all economists have systematically ignored, for example, the longer term boom and bust trajectories of economic activity. But the opinion paper does suggest a pervasive ignoring of key works associated with crises phenomena dating back from works of Walter Bagehot in 1873 to more contemporary economists such as Hyman Minsky since the 1980s.

Perhaps the most significant charge of dogmatism implicitly made by the Kiel economists is in the suggestion that models are retained in the light of considerable external evidence that would question their validity:

"The corner stones of many models in finance and macroeconomics are rather maintained *despite* all the contradictory evidence discovered in empirical research. Much of this literature shows that human subjects act in a way that bears no resemblance to the rational expectations paradigm and also have problems discovering 'rational expectations equilibria' in repeated experimental settings." (Colander, 2009, pp.7-8).

For West Churchman (1968), quoted at the beginning of this sub-section, systems thinking not only requires 'building a bigger picture' of the situation – for which he described a process of unfolding increasingly more variables from the context of use – but also appreciating other conceptual constructs or perspectives on the situation. The transition speaks of two worlds; one, the holistic ontological real-world 'universe' of interdependent elements, encapsulating complex inter-relationships; another, an epistemological socially constructed world of 'multiverse' (cf. Maturana and Poerksen, 2004, p.38), encapsulating differing constructs on reality. Failure to appreciate the multiverse world results in dogmatism (see Fig. 2)



**Figure 2** Influence diagram illustrating dogmatism in conventional thinking

Figure 2 illustrates influences of dogmatism. Situations are complex because of contrasting perspectives. Effective systems design and support requires negotiating between different perspectives. The systemic consequences of not doing so are twofold:

- (i) relevant perspectives can be marginalised and alienated, and
- (ii) there can be a reinforcement of professional self-righteousness amongst practitioners.

The results is often an increased effect of complexity (not appreciating others' perspectives) and further conflict of values in the wider situation.

The trap of dogmatism prompts a reminder that wholes are selected by someone for a purpose. Someone usually selects the whole with the purpose of making an intervention that they think will improve matters. Hence there are always different perspectives to appreciate. Other stakeholders may have different purposes associated with modelling financial realities, and hence produce different models of financial 'systems'. Such systems may be complementary and helpful, or they may be disruptive. In either case, the underpinning systems models need to be appreciated to avoid systemic failure.

Traps 1 and 2 signal the importance of Systems thinking for dealing with the bigger picture and multiple perspectives respectively. The example of systemic failure of academic economics signals an overriding third flaw often underpinning the modelling process in any discipline.



## 2.3 Reflecting on model limitations: avoiding managerialism (Trap 3)

“To a man with a hammer, everything looks like a nail” (Mark Twain)

"No problem can be solved from the same consciousness that created it. We have to learn to see the world anew." (Albert Einstein)

All systems/ models are partial. They are necessarily partial – or selective – in the dual sense of (i) representing only a section rather than the whole of the total universe of interrelationships, and (ii) serving some stakeholder parties including practitioners - and their interests - better than others (cf. Ulrich, 2002, p.41). In short, no proposal, no decision, no action, no methodology, no approach, no tool, no model, no system, can get a total grip on the situation nor get it right for everyone (Reynolds, 2008a). In using and (re)designing models we need to keep an eye on changing contexts of interrelationships and change and variety of different practitioner perspectives.

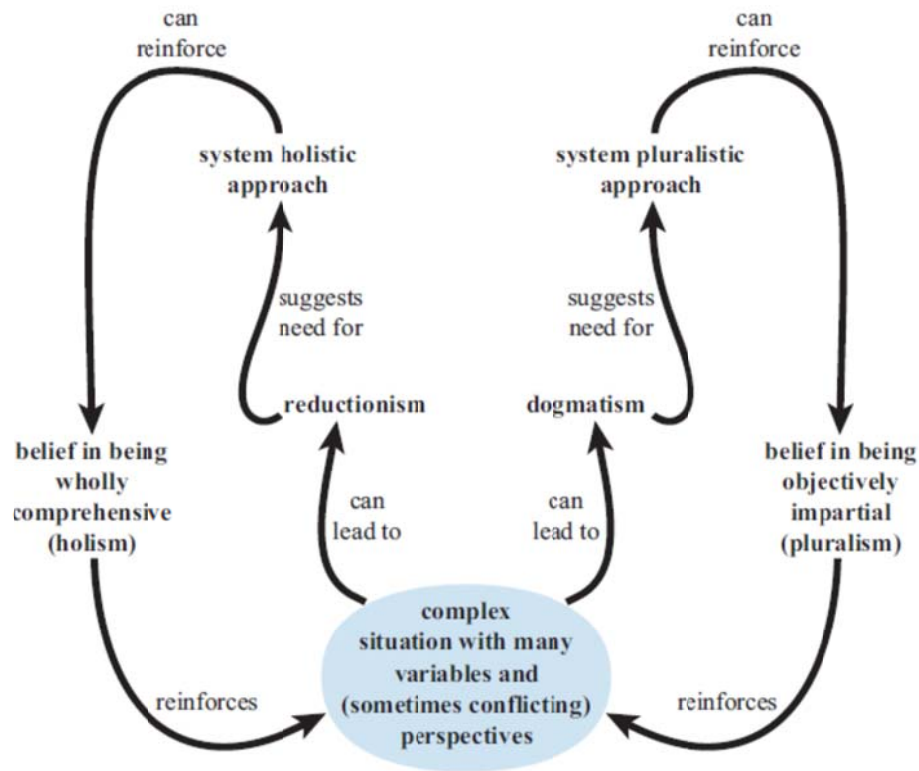
The Kiel authors provide some alternative ideas for improved modelling. Their critique of reductionism calls for a more holistic approach to economic modelling involving for example attention to risk analysis, Network theory, and actor coordination, amongst other ideas. Similarly their implicit critique of dogmatism advocates a more pluralistic approach including, for example, wider engagement with other economic viewpoints such as behavioural economics, or indeed other disciplines. Moreover, the authors call for a wider engagement between financial modellers and the wider public sphere.

But how holistic are the Kiel authors themselves? Are there effects of leaving out the political domain of economic activity? Similarly, how engaging with other perspectives are they? Behavioural economics can be important but what about ecological economics? Also, what about engaging with other related disciplines – political sciences, anthropology, philosophy, for example. And despite the open-access internet availability of the opinion paper, to what extent are the authors merely talking to each other rather than engaging wider publics on a transdisciplinary dimension?

In short, is there a risk of fetishising new improved models? Figure 3 illustrates two influence loops of traps associated with systems thinking. When these traps are enacted, there is a risk of

- (i) holism – assuming comprehensiveness, and
- (ii) pluralism – assuming impartiality.

Given the impossibility of being comprehensive and impartial, it may seem churlish to surface the weaknesses in any claims implicitly made around being holistic and pluralistic. The Kiel authors have hinted at the potential traps of holism and pluralism. As the authors point out, holistic models are to be encouraged *but* there is a need also to be transparent about the fragility of any improved models: “... while such models better capture the intrinsic volatility of markets, their improved performance, taken at face value, might again contribute to enhancing the *control illusion* of the naïve user. The increased sophistication ... *should not absolve the modellers* from explaining their limitations to the users in the financial industry” (ibid. p.6 my italics).



**Figure 3 Influence diagram illustrating the traps of holism and pluralism in systems thinking**

Similarly, pluralistic models that invite different contrasting perspectives should be encouraged but there is from the authors' collective viewpoint a need also to reveal biases: "Researchers who develop such models can claim they are *neutral academics* –developing tools that people are free to use or not. We do not find that view credible... It is the responsibility of the researcher to make clear from the outset the limitations and *underlying assumptions* of his models and warn of the dangers of their mechanic application." (ibid p.6 my italics).

Managerialism prompts the reminder that given the partiality of any systems thinking a third critical dimension is required where systems boundaries need to be made and questioned on the inevitable limitations of being holistic and pluralistic. In short, economists need to practice modesty in claims of inclusiveness, humility in levels of certitude, and responsibility regarding the implications of modelling to wider stakeholders who may have to bear the consequences. Where limitations are not acknowledged, the unquestioned boundary judgements on being holistic or pluralistic might be regarded as constituting holism and pluralism respectively- 'here is the definitive big picture!' or 'here is my unbiased compilation of viewpoints'! – both constituents of managerialism.

These acknowledgements suggest a political as well as an ethical dimension to modelling. What is important here is a critical assessment on the boundaries of modelling; what's in and what's out, and importantly, who decides what's left out. Politics of modelling requires what Werner Ulrich has termed boundary critique – a tool based upon the idea of *systemic triangulation* from a tradition of critical systems thinking. In the next section I will introduce Ulrich's notion of systemic triangulation along with a wider comparable notion of the 'iron triangle' which can be used as a basis for understanding how systemic failure works, and how to avoid it.

### 3 *Systemic triangulation and the iron triangle*

Werner Ulrich introduced the methodological concept of systemic triangulation as an extension of the conventional concept of 'triangulation' as it is known in the empirical social sciences - the idea that it makes sense to rely on different research methods/methodologies and theoretical perspectives to produce and validate research results. Ulrich's idea is to rely not only on different methods and theories but also on alternative value sets and reference systems as a basis for working out and assessing practical propositions (cf. Ulrich, 2003 p.334). The term 'systemic triangulation' as a label refers to what Ulrich calls an 'eternal triangle' of interdependence between 'facts', 'values', and 'boundary judgements' (Ulrich, 1998, p.6; 2000, p. 252).

The purposes behind models represent important judgements of boundary. The 'models' referred to by the Kiel authors can be regarded as bounded conceptual systems. They are ideas or tools used for making sense of situations such as global finance with the ultimate purpose of supporting improvement in such situations. As with all forms of systems thinking, the models comprise of three factors which, in their mutual influences on each other, can generate either failure or success. The Kiel paper on systemic failure signal these through highlighting:

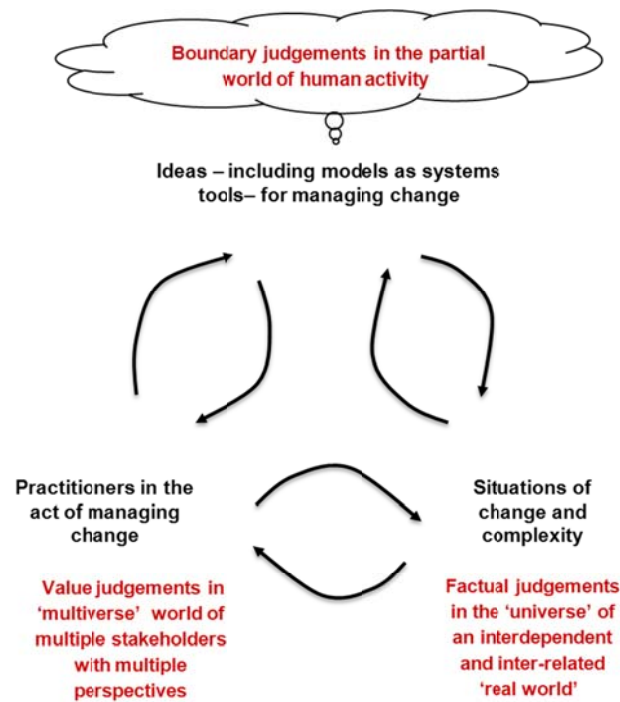
1. the importance of *interrelationships* in situations of change and complexity;
2. as viewed from practitioners' contrasting *perspectives* in the act of managing change;
3. expressed through ideas or *models* used to make sense of interrelationships and perspectives for managing change.

Fig.4 illustrates the influences between these three entities in the form of a relationship reflecting Ulrich's original notion of an eternal triangle. In my rendition of the triangle, 'facts' relate to the situations of change, 'values' relate to the practitioners managing change, and 'boundaries' relate to the ideas/ tools/ models used for managing change.<sup>1</sup>

The interplay of arrows between judgements of 'fact', value judgements, and boundary judgements is described by Ulrich in his own rendition of an 'eternal triangle':

"Thinking through the triangle means to consider each of its corners in the light of the other two. For example, what new facts become relevant if we expand the boundaries of the reference system or modify our value judgments? How do our valuations look if we consider new facts that refer to a modified reference system? In what way may our reference system fail to do justice to the perspective of different stakeholder groups? Any claim that does not reflect on the underpinning 'triangle' of boundary judgments, judgments of facts, and value judgments, risks claiming too much, by not disclosing its built-in selectivity" (Ulrich 2003 p.334)

<sup>1</sup> The 'eternal triangle' depicted in Ulrich's original diagram (Ulrich, 2000, p. 252) is also different in that it depicts 'values' and 'facts' at opposing right and left sides of the triangle floor. My reason for swapping over these triangular points is to help synchronise the triangulation with representations of the iron triangle and the systems thinking in practice heuristic discussed later in the article.



**Figure 4 Triadic relationship of influences between situations of change, practitioners managing change, and tools for managing change**

(adapted from 'the eternal triangle' of Ulrich, 2000 p.252).

The triadic relationship in Fig. 4 draws on synthesising two ideas; one is Ulrich's methodological idea of 'systemic triangulation', the other is more an ontological (and metaphorical) idea of the 'Iron Triangle' sometimes used to describe relations of power in particular contexts.

The idea of the iron triangle was first expressed by Ralph Pulitzer a political journalist reporting critically on the Paris Peace Conference amongst victorious allied governments following World War 1 in 1919 (Pulitzer and Grasty, 1919). Pulitzer was frustrated with the vicious cycle of vested interests at play in the conference deliberations. He suggested that the resultant accord is not likely to have long term success given the insipid self-contained interests amongst three sets of actors – the military, industry, and politicians making the decisions.

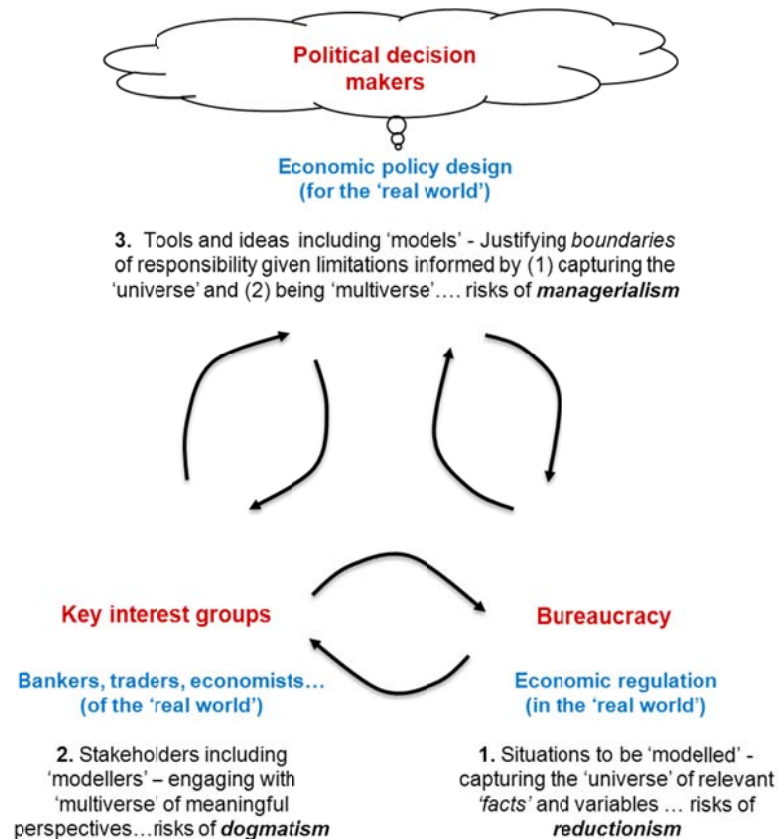
The iron triangle is a helpful concept in that it speaks to a wider sense of institutional entrapment. It has since been invoked particularly in American politics to account for vicious cycles of institutionalised vested power. One popular expression of the iron triangle is the 'military-industrial complex' used by American President Dwight Eisenhower during his 1961 Presidential resignation speech to warn of insipid vested interests in the country. An influential academic writer on the actual machinations of the iron triangle in American politics was the economist John Kenneth Galbraith (cf. 1952; 1967). The iron triangle has also been used with reference to European politics (cf. Hix and Hoyland, 2005), and amongst political activists as, for example, with Arundhati Roy in relation to her opposition to large-scale dam constructions in India (Roy, 1999). Used as a generic metaphor, the iron triangle has acquired pervasive currency in depicting systemic failure.

Generically, the concept is now typically used to describe a confluence of interaction between three entities – (i) some form of bureaucracy which represents the site of real world implementation of decisions (e.g., Ministries), (ii) interest groups/ individuals who stand to benefit from the implementation of decisions (e.g. usually commercial and corporate interests of various kinds), and (iii) decision makers themselves responsible for making decisions with supporting models for justifying decisions (e.g., Congress or Parliament).

The three domains of an iron triangle might in turn relate to the methodological idea of systemic triangulation (depicted in Fig.4) and the particular imperatives and traps of modelling. Firstly, sites of implementation of decisions might be regarded as the ‘real world’ sites of inter-relationships to be modelled (invoking ‘factual judgements’ and the risks of reductionism). Secondly, interest groups might be regarded as constituting key stakeholders and perspectives including the modellers themselves (invoking ‘value judgements’ and the risks of dogmatism). Thirdly, decision makers require tools or models to support their decision making (invoking ‘boundary judgements’ and risks of managerialism). Figure 5 is an expression of an iron triangle depicting these triadic influences with traps of thinking, as described above, associated with the systemic crises arising from prevailing economic modelling.

Items labelled 1 to 3 in Fig.5 relate more specifically to the concerns of those engaged with modelling. The methodological concerns regarding traps of thinking are aligned with ontological concerns relating to the wider trap of an iron triangle. The three corners of the triangle represent the three aspects of systemic failure signalled in the Kiel paper: firstly, the problem in formulating judgements of ‘fact’ regarding the universe of *inter-relationships* in situations of interest; secondly, engaging with the multiverse of value judgements associated with peoples’ contrasting *perspectives* including those from disciplines outside of economics; and thirdly, making effective boundary judgements expressed through ideas or *models* used to make critical sense of inter-relationships and perspectives in order to support effective decision making.

So how might the triangulation of the iron triangle be translated from the rather purposive fixed relationships in ‘traps of thinking’ towards a more purposeful notion of creative or ‘enlightened thinking’ for better systems design? The underpinning ideas of the iron triangle and systemic triangulation can be traced back to traditions of early American pragmatism spearheaded by Charles Peirce (cf. Peirce, 1878), and continued with practitioner philosophers including the psychologist William James and educationalist John Dewey. Such practitioners contributed significantly to their fields in promoting more purposeful professional praxis. The challenge in systems thinking is to translate such critical insight into a more purposeful framework; a challenge that can serve the wider endeavour of continually reframing expert support for policy design (cf. Reynolds, 2008b).

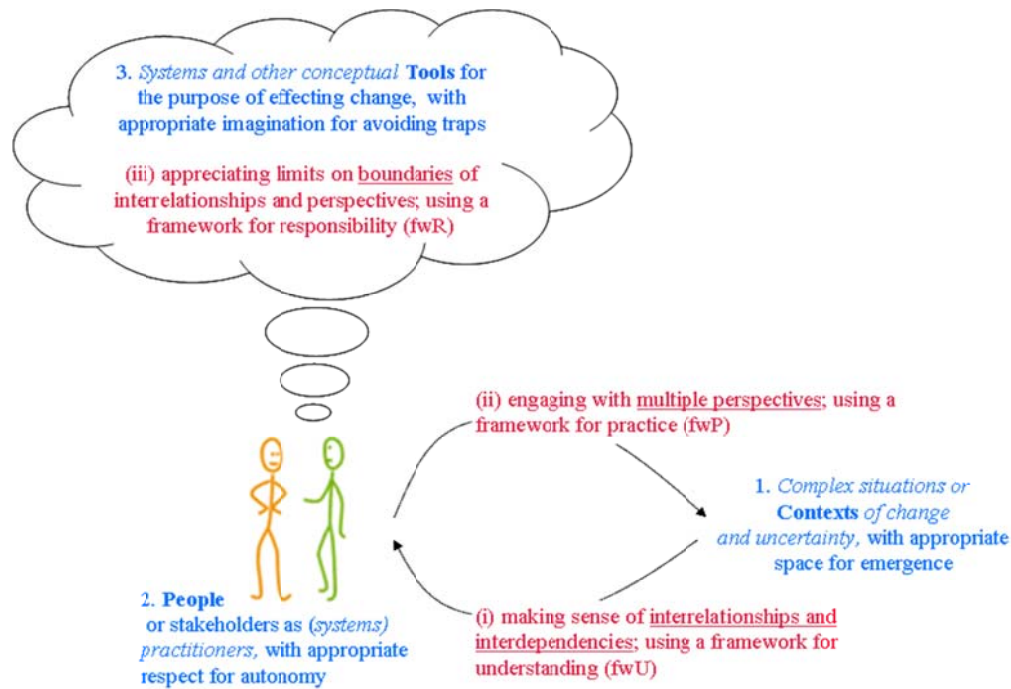


**Figure 5 The iron triangle of economic modelling and traps of thinking**  
(adapted from Reynolds, 2008a)

#### **4 Systemic design: a systems thinking in practice heuristic**

A systems thinking *in practice* heuristic builds on the three entities associated with systemic failure described above: (1) real-world *contexts* of change and uncertainty, (2) stakeholders or *practitioners* involved with making change, and (3) the ideas and concepts – including systems - as *tools* for effecting change. These can be complemented with three interrelated activities: (i) stepping back from messy situations of complexity, change, and uncertainty, and *understanding* key inter-relationships and perspectives on the situation; (ii) *practically* engaging with multiple often contrasting perspectives amongst stakeholders involved with and affected by the situation, and (iii) *responsibly* directing joined-up thinking with action to bring about morally justifiable improvements. These activities are supported by three frameworks respectively – framework for understanding (fwU), framework for practice (fwP), and a framework for responsibility (fwR) - constituting what elsewhere has been called an overall critical systems framework (Reynolds 2008a). More recently this framework has been translated in terms of a learning device or heuristic. The heuristic - systems thinking in practice - is the namesake of the UK-based Open University postgraduate programme to which the author has with colleagues contributed development and authorship in one of the key modules (Open University, 2012).

Figure 6 illustrates the constituent activities and entities of the heuristic for systems thinking in practice.



**Figure 6 Heuristic of systems thinking in practice**  
(adapted from Reynolds, 2011b)

The heuristic provides a benchmark for mitigating against systemic failure in managing change. The systems tradition has developed a variety of tools for dealing with each of the three entities associated with the three traps of thinking.

First, the need for ‘joined-up-thinking’ to alleviate reductionism. Systems ideas in this tradition include expressions of first order cybernetics such as the viable systems model underpinning *The Brain of the Firm* (Beer 1972), and system dynamics underpinning *Limits to Growth* (Meadows *et al.* 1972), and ‘systems thinking’ in *The Fifth Discipline* (Senge 1990). The holistic principle is ontological; a statement about real world interconnectedness and feedback.

Second, the development of constructivist tools for addressing problems of dogmatism. Systems are here based on the epistemological notion of conceptual constructs used for developing knowledge about reality as well as guiding our activities in reshaping reality – serving the need for making new realities. Systems ideas in this tradition include second-order cybernetics such as *autopoiesis* (Maturana and Varela 1980) and a range of *problem-structuring methods* including soft systems methodology, cognitive mapping and others (Rosenhead and Mingers 2001). Such works raise important questions regarding how to respond to multiple stakeholder perspectives or, as Maturana puts it, how to practice being epistemologically ‘multiverse’, as distinct from assuming access to some ontological ‘universe’ (Maturana and Poerksen 2004 p.38).

A third critical systems tradition deals with the methodological limitations and inevitable problems of selectivity in thinking holistically and interconnectedly, and being pluralistically multiverse whilst avoiding tendencies of managerialism. Critical systems thinking (CST) is an umbrella term used in association with this third tradition (Ulrich 2003; Jackson 2003). The framework in Fig.6 provides an expression of CST derived particularly from Ulrich's work on boundary critique.

Whilst some tools may have a particular focus on one of the three activities and associated entities, the effectiveness of use in supporting decision making can be gauged according to how well all three entities are dealt with. The rich history and current variety of systems tools prompt questions as to how they may relate to each other and what emphasis is given to the context of use, the users or practitioners, or the actual tools being used (Reynolds and Howell, 2010). The tools used in systems thinking in practice need not be exclusively recognised as being derived from what some recognise as the Systems tradition. They may derive from traditions ranging from Complexity science to Performance arts such as puppetry. Any tools that attempt to:

- (i) make sense of a context of complex realities whilst
- (ii) enabling amongst practitioners different perspectives on such realities to flourish in order to
- (iii) enable systemic improvement in the real world,

qualify to be exemplars of systems thinking in practice.

What matters in systems thinking in practice are not just the expression of these three entities, but also the interplay amongst all three entities and associated activities, and the resultant dynamics of supportive change that emerge.

## 5 Summary

The final paragraph of the Kiel opinion paper states:

“We believe that economics has been trapped in a sub-optimal equilibrium in which much of its research efforts are not directed towards the most prevalent needs of society... Defining away the most prevalent economic problems of modern economies and failing to communicate the limitations and assumptions of its popular models, the economics profession bears some responsibility for the current crisis. It has failed in its duty to society to provide as much insight as possible into the workings of the economy and in providing warnings about the tools it created. It has also been reluctant to emphasize the limitations of its analysis. We believe that the failure to even envisage the current problems of the worldwide financial system and the inability of standard macro and finance models to provide any insight into ongoing events make a strong case for a major reorientation in these areas and a reconsideration of their basic premises.” (Colander et. al., 2009, p.14)

From a systems thinking in practice perspective, systemic failure in economic modelling results from three interwoven factors - (i) disconnects amongst essential contextual entities by omission of key variables from models, (ii) disengagements amongst relevant perspectives associated with different stakeholders typically marginalised within economics, and (iii) dysfunctional application of boundary judgements in the models used to support economic decision making. The three traps of thinking described above in terms of reductionism, dogmatism and managerialism, are not new. The trap of reductionism in particular has wide currency in the popular mantra for advocating more (holistic) systems thinking.

The confluence of three traps working together through a process of systemic triangulation is perhaps less widely appreciated. When coupled with the wider triangulation of the Iron Triangle appreciated by political scientists and political activists there is possibly an increase sense of resonance and relevance



between what economists do in their modelling activities and what significance they may have further afield. Ralph Pulitzer, originator of the contemporary use of 'iron triangle' in reflecting on what he regarded as the long-term failure of post- First World War Peace conference, died in June 1939, a few months before the outbreak of the Second World War. John Kenneth Galbraith, the most prominent academic to have enriched the notion of 'iron triangle' through scholarly work died in 2006, a few years before the global financial collapse which many claim vindicated much of what Galbraith had argued regarding the paucity of orthodox economics (e.g. Kates, 2010; Latham, Prowle, and Wheatley, 2012)

A particularly helpful place to start any reorientation and reconsideration of international finance might be through critically exploring the dynamics of macro-economic modelling that supports economic decision making. David Colander and his seven economist colleagues provide a promising start. The systems thinking in practice heuristic provides one means of supporting such explorations.

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